

ABOUT THESE MAPS

Maps a, b and c show the at-sea density (birds/km²) of Leach's Storm-Petrel (*Oceanodroma leucorhoa*) in three ocean seasons – Upwelling, Oceanic, and Davidson Current, displayed in cells of 5' latitude by 5' longitude. Densities are based on the combined data sets of several studies; see the Data and Analyses section of this chapter. The color and mapping intervals were selected to show the most structure and highlight significant areas, while allowing comparisons among marine bird species. Cells that were surveyed but in which no Leach's Storm-Petrels were observed have a density of zero. Areas not surveyed appear white; no information was available for these areas. Blue lines indicate the boundaries of the National Marine Sanctuaries in the study area: Cordell Bank, Gulf of the Farallones and Monterey Bay. Bathymetric contours for the 200 m and 2,000 m isobaths are shown in light blue.

In order to provide an integrated look at the patterns of a species' spatial and temporal occurrence and abundance in the study area, map d shows seasonal high-use areas, displayed in cells of 10' latitude by 10' longitude, and also breeding colonies (when available). The seasonal high use map provides a further synthesis of densities presented in maps a, b and c, and portrays the relative importance of various areas to the species. Areas with consistently high use are highlighted. See the Data and Analyses section of this chapter for further explanation of high-use areas. Because the sighting data for this species extends significantly beyond the western extent of the standard map frame used in this project, additional maps are provided for this species in Appendix 3A that include a greater western extent.

DATA SOURCES AND METHODS

The at-sea data set is referred to as the CDAS central California data set (1980-2001) and was developed using software called Marine Mammal and Seabird Computer Data Analysis System (CDAS), by the R.G. Ford Consulting Co. The data set extends from Pt. Arena to Pt. Sal in the study area, and the surveys used were conducted between 1980 and 2001. See the Data and Analyses section of this chapter for more information on the at-sea survey data sets and methods

Data on colony sizes are dated and were obtained from Ainley and Lewis (1974), SOWLS *et al.*, (1980) and Carter *et al.*, (1992).

RESULTS AND DISCUSSION

The Leach's Storm-Petrel has a breeding population numbering in the millions among islands ringing the northern North Pacific; this species nests south to Baja California in the eastern Pacific (Carter *et al.*, 1992). In comparison, the estimated 12,551 birds breeding at sites along the California coast is small. This low number relative to its Pacific population, and the fact that this species is highly migratory, suggests that many of the birds seen in the study area are migrants. This was also indicated by the lack of importance in a multiple regression model of distance to colony as a factor explaining this species' variation in cell density; see Table 3.8. At-sea surveys recorded in CDAS contained 1,118 sightings or 1,576 individuals, despite survey effort being sparse in the offshore waters where this species frequents.

Leach's Storm-Petrel is a common species that frequents waters much farther offshore than the other storm-petrels, i.e., well beyond the continental slope. Thus, the National Marine Sanctuary boundaries (and most of the data sets in this study) do not encompass much of this species' preferred habitat. The species was most abundant during the Upwelling Season (breeding) and occurred relatively closer to the coast than in other seasons. This species visits the small Farallon and other colonies only at night, and are at sea or attending nest burrows during the day. During the Oceanic and Davidson Current seasons few birds occurred in waters near the shelf. The birds present during the latter two seasons likely were migrants from more northern populations.

A multiple regression model of nine independent variables in the CDAS data set explained 28.4% of variation in cell density, indicating that this species responded consistently to the variables examined. Most important of the nine variables were season, distance to the 2000 m isobath, and ENSO period (periods of unusually warm or cool ocean temperature); see Table 3.8. At sea, abundance of this species in the study area has increased between 1985 and 2002, and it was more abundant during periods of warm-water conditions. This contrasts with apparent trends at the main colony in the study area (South Farallon Islands), where the species appears to have declined dramatically since the early 1970s (PRBO, unpubl. data; G. J. McChesney, unpubl. data).

Leach's Storm-Petrels feed on invertebrates and larval fish captured at the surface. See Tables 3.5, 3.8, 3.9., 3.10 and 3.11 for related summary information.